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THE PLANT DISEASE BULLETIN

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The Plant Disease Survey

Number 7, November 15,
1917.

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

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ANNOUNCEMENT

The collecting of timely information on diseases of the principal food crops through the system of special disease reports and the distributing of this information by means of the Plant Disease Bulletin has apparently met with a large measure of success. This has been due to the hearty cooperation of collaborators and others concerned. Now that the growing season is practically over the Bulletin for 1917 will be discontinued with this number. Since the publication may have some value as a source for reference however, an index for all the 1917 numbers is being prepared and will be mailed shortly. Next season the value of the Bulletin should be materially increased because of improvement in the facilities for collecting information and for issuing the Bulletin promptly.

Work is now under way on the preparation of an annual report. Requests for contributions to this report have been made already to collaborators and certain other plant pathologists. It is planned to utilize all possible sources from which information may be obtained. Readers of this Bulletin are urged to send in any authentic records they may have concerning the occurrence, prevalence, severity, etc., of plant diseases during the past year.

CONTENTS OF THIS NUMBER

The present number of the Bulletin contains summaries of the results obtained by twelve field assistants who made a survey for the disease of corn caused by Physoderma and for potash hunger and certain boll rot diseases of cotton. Work was started in the states of Louisiana, Mississippi, Alabama, Georgia and North and South Carolina. From these states the men moved northward and westward, going into all states with the exception of New England, North Dakota, Montana, Idaho, Utah, Arizona, Nevada, California, Washington and Oregon.

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CORN

Disease caused by Physoderma zeae-maydis.

In the first issue of the Plant Disease Bulletin, pages 9 and 10, there was given a summary of the distribution of Physoderma zeae-maydis Shaw on Indian corn as known at that time. The disease was prevalent in North Carolina, South Carolina, Georgia, Florida, Alabama and Mississippi. During July and August, Professor S. H. Essary, Plant Disease Survey collaborator for Tennessee, found it to be widely distributed in that state.

In a later issue (Pl. Dis. Bul. 1917: 52) it was further stated that the Plant Disease Survey was sending into the field a force of twelve scouts to study the disease. This survey was undertaken after close consultation with the Office of Cereal Investigations, particularly with Dr. W. H. Tisdale. The scouts were assembled at Clemson College, S. C., September 10-13, where they were given careful instruction by Dr. Tisdale in recognizing the disease and in methods of collecting the information desired. They were then sent into the field with special report blanks for recording their observations. Specimens were sent to this office from all points visited that the scouts' findings might be checked up by microscopic examination of the material.

INFORMATION DESIRED

Information was desired on the following general topics:

1. Distribution of Physoderma beyond the borders of the seven states named above, with data on its rate of spread and the nature of the menace to the corn belt of the north and middle west.
2. The influence of environmental factors, such as climate, soil and elevation.
3. The general nature of the disease, parts of host plant attacked, injury caused and resulting damage to the corn crop.
4. Dissemination of the causal organism with special reference to its presence on other hosts than corn.

Data on these points were needed by Dr. Tisdale in his researches on the disease. The potential menace to the northern corn belt was a matter of great importance in view of the present food situation.

METHOD OF WORK

An intensive study was made of restricted regions in North Carolina, South Carolina, Georgia, Alabama and Mississippi, to obtain data on the last three topics mentioned above. This occupied between three and four weeks. About October 7 the scouts moved north and west to obtain data on the distribution of Physoderma and if possible to map its present limits. This occupied about one month and it was found that the disease had spread much farther than had been anticipated.

A little later the Plant Disease Survey collaborators will be sent more detailed summaries of the data gathered in their respective states.

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RESULTS

The following summary of results has been prepared in consultation with Dr. Tisdale:

1. Present Distribution. Physoderma was found to be prevalent in Louisiana, Arkansas, eastern Texas, and Oklahoma, southeastern Missouri, southern Illinois and Indiana, Kentucky, and along the Atlantic Coast as far north as southern New Jersey. It occurs sparsely both to the west and north of these limits, the most northern collection being made at Passaic, N. J.; Winona, Minn.; and Yankton, S. D., the most western at Central City, Nebr.; Chickasha, Okla.; and San Antonio, Texas. Nineteen states have been added to the list of those having Physoderma, making twenty-six in all.

In the northern and western regions prolonged search in a locality sometimes yielded only one or two diseased plants, thus making it largely a matter of chance whether or not the scout found the disease. The fact that the corn was dry and largely harvested also increased the difficulties. If the survey had been made one month earlier we should undoubtedly have located the disease in many places where the scouts have now reported it as not present.

The accompanying map shows the present known distribution of the disease. It is altogether probable that Physoderma occurs in favorable localities, and during moist hot seasons, to the north and west of the points indicated, but our scouts were unable to find it this fall.

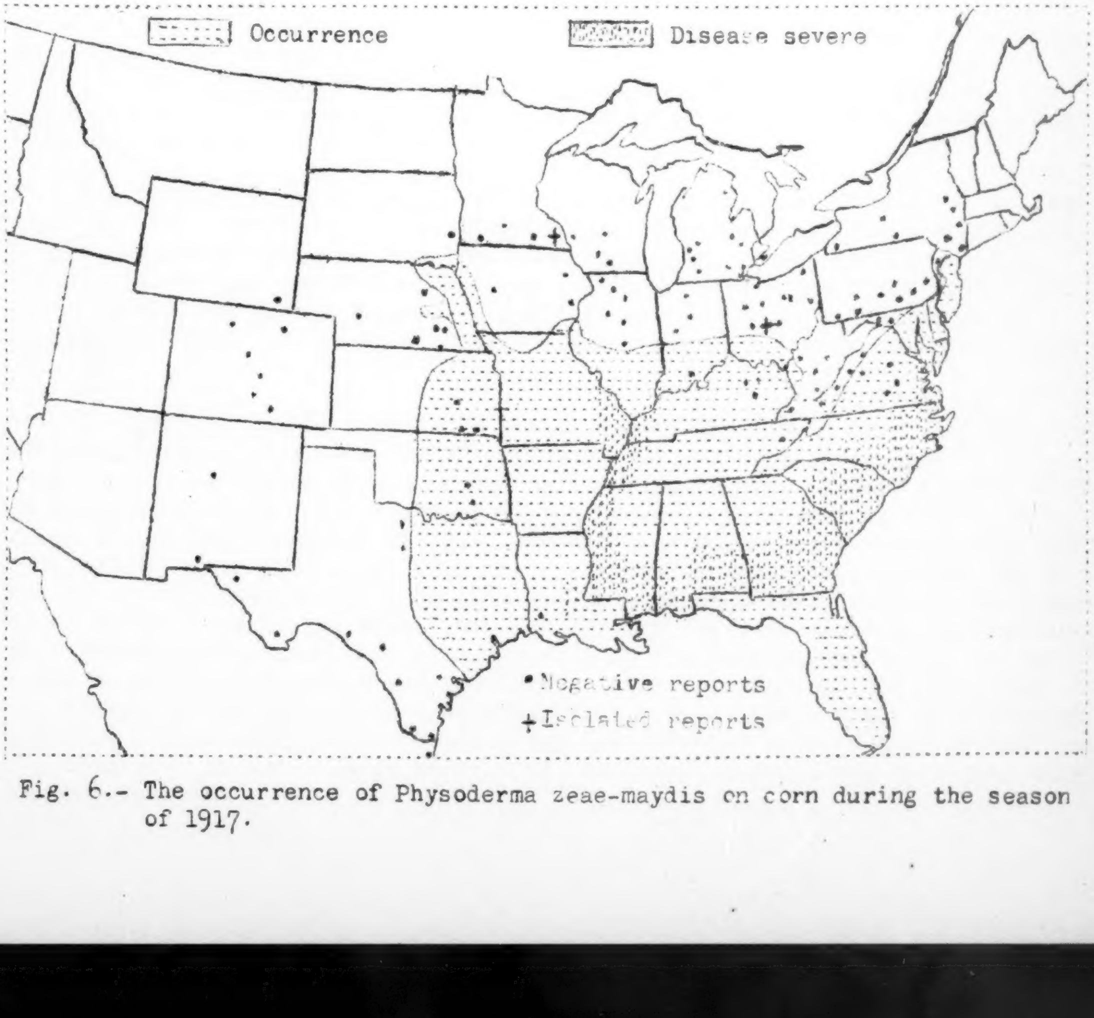

Fig. 6.- The occurrence of Physoderma zeae-maydis on corn during the season of 1917.

Unquestionably Physoderma has been in the United States many years and has spread almost, if not quite, to its northern and western limits where it is held in check by factors to be mentioned later, especially low temperature in the north and lack of sufficient moisture in the west.

2. Environmental Factors Influencing Development.

A. Temperature and Moisture. A proper combination of continuous high temperature and considerable precipitation is necessary for the extensive development of Physoderma and this must come during the early half of the life of the corn plant if great damage is to result. Infection late in the season may cause abundant development on leaves and sheaths without materially injuring the grain. In dry regions the disease is more pronounced on corn near water or on low wet land, probably on account of the moister atmosphere in these regions. As a rule heavy stands of corn are injured more than light ones, doubtless due to the fact that in heavy stands moisture is held longer in buds and sheaths. For the same reason large plants suffer more than neighboring small ones.

B. Elevation. Physoderma was at first reported as a lowland disease. It appears, however, that the controlling factors are temperature and moisture rather than elevation, little noticeable difference being found this year in the amount and severity of the disease on high or low land, provided the elevation was not sufficient to cause cold nights and to influence the precipitation. The disease was found at many points in the Blue Ridge Mountains up to 3,000 feet or more but it was not abundant or severe there, probably on account of the cold nights.

C. Soil Type. Physoderma was found on all types of soil and the influence of soil is evidently slight or wanting except as soil moisture may influence atmospheric moisture.

3. Nature of the Disease. Blade infections are very common but in general of minor importance. Infections of the sheath are even more common and of greater importance, the sheaths frequently being rotted through at the nodes. Spores are washed down between sheath and stalk where they find optimum conditions for germination. Stalk infection normally follows heavy sheath infection, the stalk in severe cases becoming so weakened as to break off.

4. Damage. Early reports of losses due to Physoderma were very conflicting, ranging from zero to 50% or over. Scouts were instructed to make very careful estimates of loss based on accurate counts. Injury to the grain only was considered. The greatest losses occurred this year in the coast regions of the Carolinas and Georgia, the Gulf and Delta regions of Mississippi, and certain other warm areas with heavy rainfall in the early summer. Here the damage was commonly 5% and sometimes as high as 8-10%. In most other portions of the country the season was too dry for heavy development of Physoderma. Considerable damage was also reported in the Mississippi Valley as far north as southern Illinois and Missouri. Aside from the regions mentioned the damage in the south this season was from 1-2% or less, while in the north and west it was negligible. Considering the infected area as a whole the loss for this year is not a large percent of the crop, although the aggregate total is considerable.

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[illegible] although the aggregate total is considerable.

During normal years the losses will probably be confined largely to the south Atlantic and Gulf states, to the lower Mississippi Valley and to any other localities with continuous high temperatures through the summer, and with considerable rainfall, especially in the early corn season. Under exceptional conditions, considerable damage may be expected well up in the Mississippi Valley but during most years in the north the cold nights and cold rains during the early corn season will check development of the disease and later on there is usually too little moisture. In the western and southwestern regions there is insufficient precipitation.

5. Factors Influencing Dissemination. Continuous cropping of land to corn, which occurs in certain swamp lands and overflow lands in the south results in an increasing amount of infection. The disease was often found to be most severe on fields which had been heavily fertilized with barnyard manure, into which spores had evidently been introduced on diseased corn used as fodder.

In a number of cases fields were found to be heavily infested where corn was seldom raised or where it had never been planted before. In some of these instances the seed had been obtained from an infested region. Although there is no evidence that the disease attacks the kernels the resting spores may easily cling to the seed and thus be introduced to new territory.

6. New Hosts. Careful watch was kept for other hosts of Physoderma and the disease was found on Teosinte at two points in South Carolina and one point in Louisiana. Mr. H. S. Stahl found considerable infection on Teosinte at Florence, S. C. Dr. Tisdale also located it at Clemson College. Somewhat later Mr. F. F. Blaine found Teosinte infected at Crowley, La., without knowing of the South Carolina finds. Careful watch failed to locate the disease on sugar cane, sorghum or wild grasses. The finding of Physoderma on Teosinte makes it possible that there are other hosts in this country, perhaps wild grasses, and that the appearance of the disease in fields never before planted to corn may be due to its presence on these wild hosts.

COTTON

Potash Hunger caused by insufficient potash.

Lack of potash in cotton produces the condition known to planters as "rust". The leaves take on a reddish color with yellow or reddish areas between the leaf veins. This is followed by fungus invasion and by defoliation.

The following summary of results of a survey by field scouts was prepared in collaboration with the Office of Cotton, Truck and Forage Disease Investigations, Bureau of Plant Industry:

Potash hunger occurs gnerally, with some exceptions, throughout the cotton growing area, causing losses varying from slight to as high as 200 pounds of lint cotton per acre. The accompanying map shows the areas where it has been located and percentages of loss (pounds per acre) as determined by field men.

During normal years the losses will probably be confined largely to the south Atlantic and Gulf states, to the lower Mississippi Valley and to any other localities with temperatures that remain high through the summer, and with considerable rainfall especially in the early part of the season. Under exceptional conditions, however, losses may be expected well up in the Mississippi Valley and [illegible], since in the north the cold nights and cool rains during the early part of the season [illegible] of the disease and later on there is usually too little moisture. In the western and southwestern sections there is [illegible].

2. [illegible]. [illegible] cropping of land to [illegible] in the south results in [illegible]. The [illegible] and [illegible] found in [illegible] with [illegible] corn [illegible].

In a number of [illegible] soils [illegible] cotton [illegible]. In some of these [illegible]. Although there is [illegible] may [illegible].

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Loss to cotton [illegible] planters as "rust". The leaves [illegible] between the leaf veins. This is followed by [illegible] and by defoliation.

The following summary of results of a survey by field men was prepared in collaboration with the [illegible] investigations, Bureau of Plant Industry.

Potash hunger causes, [illegible] throughout the cotton growing area, [illegible] from slight to as high as 200 pounds of lint cotton per acre. The accompanying map shows the areas where it has been located and percentages of loss (pounds per acre) as determined by field men.

As a rule potash hunger is much more severe on sandy or sandy loam soils than on clay or clay loam soils; and is worse on hard pipe clay soils than on porous clay loam, or than on sandy loams. In the few instances in which potash fertilizer was applied injury was nearly always prevented. Applications of sodium nitrate usually prevented defoliation of the plants by potash hunger, but it kept the cotton from maturing as rapidly as it should. Liberal applications of stable manure almost always prevented injury.

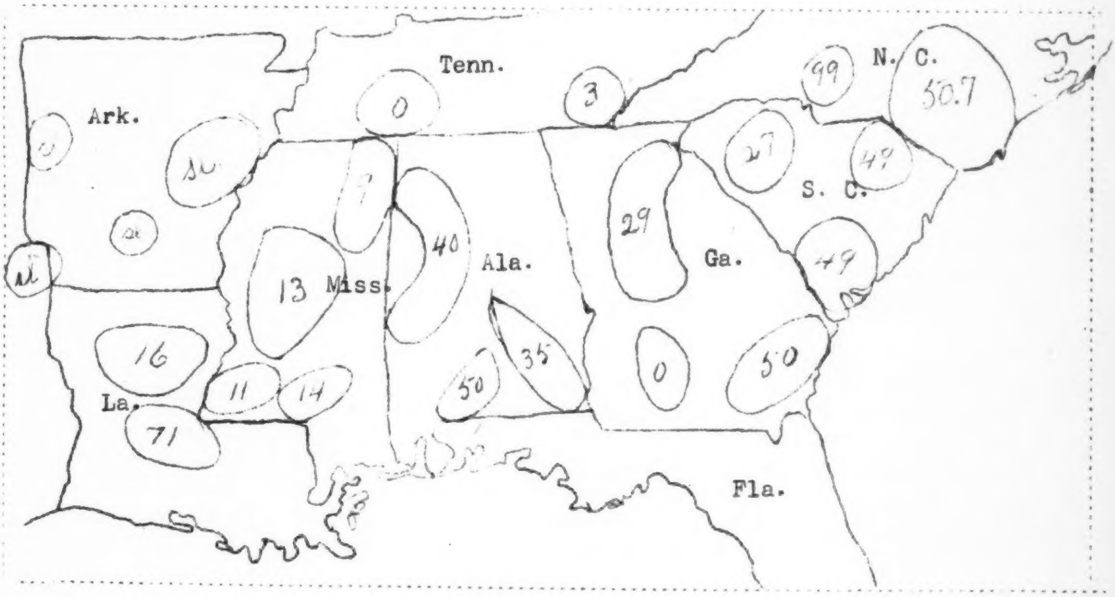

Fig. 7. Map showing cotton areas surveyed by field scouts for potash hunger. The figures represent average number of pounds of lint cotton lost per acre on account of the disease.

Alabama: Prevalent throughout this state, It is very evenly distributed, no one section being more seriously affected than another.

Arkansas: Very slight, when present at all. As a rule, the fields are not suffering from this injury. There were so few reports from this state that it is impossible to give anything specific.

Georgia: The injury is very general throughout the state. In the southeastern part there is a group of counties in which the loss is considerable, while in the southwestern section the counties which were surveyed are suffering very little loss, but potash hunger is present generally. In the northern part of Georgia where the soil is mostly loam, or sandy loam, with clay subsoil, the loss per acre is less than in other parts of the state but even here the damage is considerable.

Kentucky: Injury was found in Hickman County.

Louisiana: Potash hunger seems to be very serious in some localities and entirely absent from others. In Franklin and Ouachita Counties this injury is reported to be serious while in Lincoln, Webster, Winn and Rapides Counties the loss is very slight. On the whole, cotton in Louisiana is not suffering much from the disease.

Mississippi: Potash hunger is very slight in this state. It was reported not to be present at all in Madison, Yazoo, Sunflower, Montgomery and Grenada Counties. In a group of counties in the southern part of the state and in a group in the northern part of the state it was found to be present in some fields but not causing very much loss. It was worse in the low spots in the fields than on higher places.

North Carolina: As shown by the map, there is more loss per acre due to potash hunger in this state than in any other. It is very serious on the sandy soils, and also on what is called "blackjack" clays.

South Carolina: In the sand-hill section of this state, injury from potash hunger is very severe and almost every field shows the disease to some extent. While the map does not show so much loss per acre as in some other places, the injury is so generally distributed that the aggregate loss is great. In the Piedmont section considerable loss is being caused in certain localities but potash hunger is not so generally present as in the sand-hill section. In sections of Greenwood County, where the soil is a pipe clay, the cotton crop is reduced one-half.

Tennessee: While a few spots in cotton fields were injured by potash hunger wherever surveys were made in this state, the damage from it was very slight. Polk and McMinn Counties show more injury than the counties in the western part of the state.

Texas: Disease evidently present in many fields but on account of the fact that the cotton leaves had been killed by frost when the survey in this state was made, accurate percentages could not be determined. Apparently however, the disease is not causing much loss.

Boll Rots.

The data collected by the field assistants of the Plant Disease Survey on the occurrence of the various cotton boll rots were recorded by them on blank forms and sent directly to Mr. R. C. Faulwetter, South Carolina Agricultural Experiment Station, who is making a special study of these troubles. The facts on these diseases here presented were prepared from a summary of results furnished by Mr. Faulwetter.

[illegible]: It was found in [illegible] County.

[illegible] in some localities [illegible] and Diabrotica [illegible] in Lincoln, Neb- [illegible] slight. On the [illegible] from the disease.

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[illegible] loss per cent due to [illegible] It is very serious [illegible] "Cloverjack" clays.

[illegible] injury from [illegible] shows the dis- [illegible] much late per [illegible] generally distrib- [illegible] In the [illegible] section [illegible] but potash [illegible] section. In [illegible] soil is a [illegible] clay, the [illegible]

[illegible] by potash [illegible] the damage from [illegible] injury than [illegible]

Texas: [illegible] of the [illegible] of de- [illegible] not causing much loss.

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The data collected by the field assistants of the Plant Disease Survey on the occurrence of [illegible] results furnished by [illegible]

Table 5.- The number of farms and the number of acres of cotton examined by field assistants during September and October 1917. The percentages of boll rot diseases were determined by counts in these fields.

State	Cotton acreage of state, census 1909.	Number of farms inspected.	Number of acres of cotton inspected.
Texas	9,930,179	9	153
Georgia	4,883,304	93	817
Alabama	3,730,482	77	1088
Mississippi	3,400,210	100	1543
South Carolina	2,556,467	44	729
Arkansas	2,153,222	4	57
North Carolina	1,274,404	22	1063
Louisiana	957,011	47	3618
Tennessee	787,516	24	157
		420	9225

Anthracnose (on cotton bolls) caused by Colletotrichum gossypii.

Reported as being slight in Alabama and Mississippi, due to the severe drought prevailing in that section in the early part of the summer. (See Fig. 7)

Diplodia Boll Rot caused by Diplodia gossypina.

This disease was severe in parts of Mississippi and Louisiana, particularly in low places and on the lower branches of the plants. The accompanying map (Fig. 8) shows the amount of infection in the various areas surveyed by the field men.

Bacterial Boll Rot caused by Bacterium malvacearum.

This disease seems to be very irregularly distributed but it is generally located in the more northern sections. The accompanying map (Fig. 9) shows the severity in the areas studies.

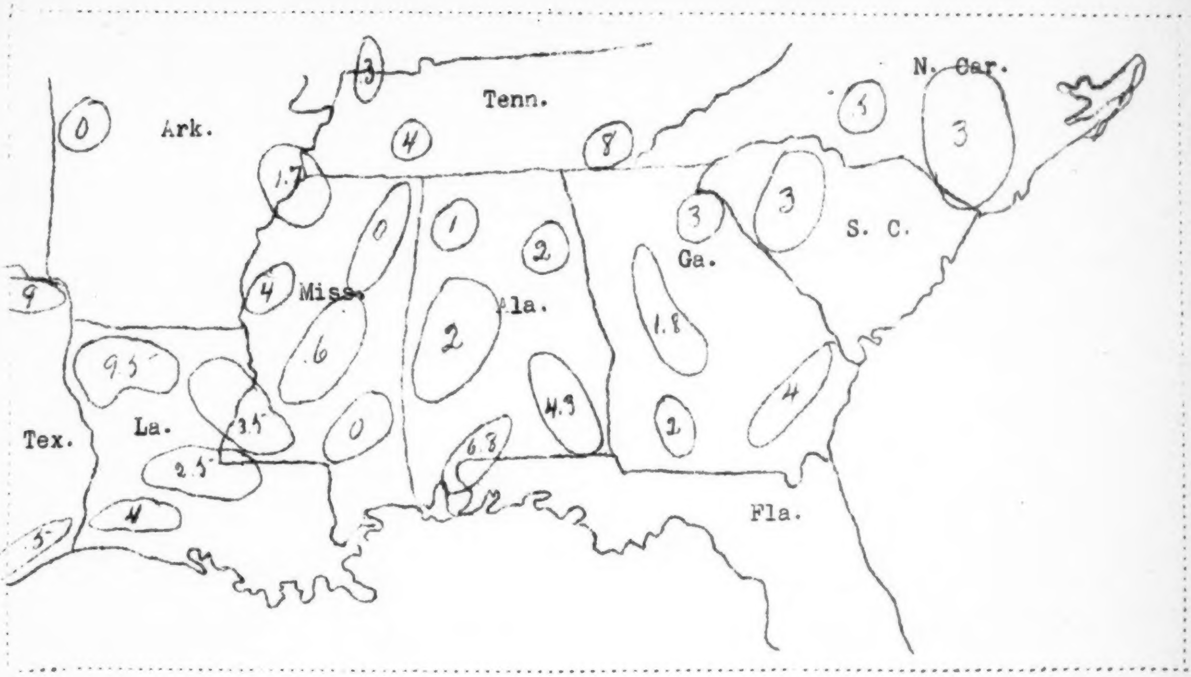
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Fig. 7.- Map showing percentages of cotton bolls infected with Colletotrichum gossypii in regions where fields were examined by field assistants of the Plant Disease Survey during September and October 1917.

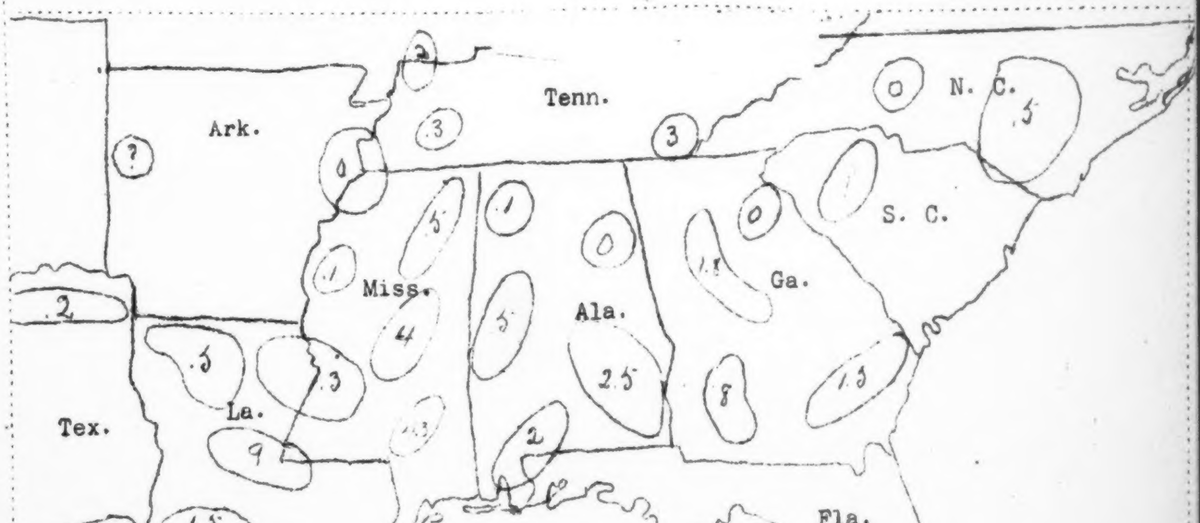
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Fig. 7.- Map showing percentages of cotton bolls infected with Diplodia gossypina in regions where fields were examined by field assistants of the Plant Disease Survey during September and October 1917.

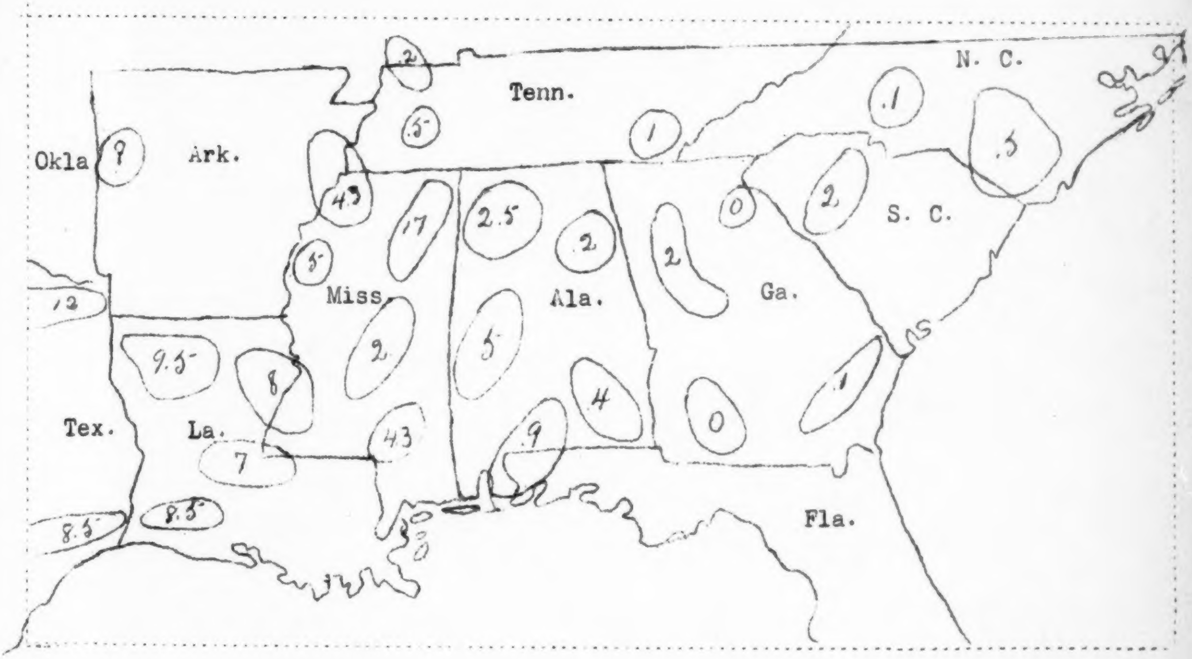
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Fig. 9.- Map showing percentages of cotton bolls infected with Bacterium malvacearum in regions where fields were examined by field assistants of the Plant Disease Survey during September and October 1917.